T H E S I S

on

"THE LARYNGITIS OF SCARLET FEVER"

(with NOTES OF CASES")

by

HECTOR MACKAY CALDER, M.B., Ch.B.

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 – 1346

I N T R O D U C T I O N.

The object of this thesis is to discuss the special form of laryngitis which may occur during an attack of scarlet fever. I was led to pursue investigations on the subject as I have had recently in my scarlet fever wards two or three cases which presented this complication. While these cases were of a mild type questions arose both as to their diagnosis and prognosis.

The subject is worthy of notice, and I have therefore reviewed the cases of scarlet fever complicated by this laryngeal affection, in the Eastern Fever Hospital, Homerton, and have extracted the details of all such cases occurring during the ten years from 1903 to 1912. This period I think will be sufficient for the purposes of my thesis, as it embraces a sufficient number of cases from which to glean some real information. The thesis is confined to cases which were undoubtedly those of scarlet fever, complicated by this special form of laryngitis. Cases of laryngitis due to such definite diseases as measles or diphtheria are excluded. I may say that all the cases were bacteriologically examined for diphtheria bacilli, but in each case the examination was negative.

As the whole question of the pathology and morbid anatomy is of importance I have drawn on all the

available post-mortem records in the Eastern Hospital for information which has any bearing on the subject.

As the space occupied by the reports of the cases is considerable I have thought it advisable to cut down the details as much as possible but all particulars bearing any relation in any way to the laryngeal condition are set out in full. Similarly as all were cases of scarlet fever, I have avoided any detailed account of the symptoms pointing to that disease.

L I T E R A T U R E.

On consulting such authorities as were available I was struck with the little attention that has been paid to laryngeal involvement in scarlet fever, both in the text books on infectious diseases and also in those on diseases of the throat. Very early authorities, such as Huxham[11] in cases which were doubtfully those of scarlet fever, describe symptoms pointing to implication of the larynx.

Fothergill[5] in his "Account of the Putrid Sore Throat", which is generally believed to be a severe type of scarlet fever, gives the case of a girl, who developed difficulty in breathing and died within 24 hours of the commencement of the attack. "A large quantity of viscid phlegm with which, after she was dead, together with the tumefied uvula, tonsils and velum palati had perhaps jointly closed the rima glottidis and put a stop to respiration." Up to the time of Bretonneau[1] I can find no definite reference to this laryngeal condition. Bretonneau denied that there was any tendency whatsoever, for the "scarlatinal phlegmasia" to spread to the larynx. During his twenty years experience he had never seen death result from laryngeal involvement.

Trousseau[22] is not so emphatic in his statements but remarks that "Scarlatina does not like the larynx." He further states "true scarlatinous sore throat, then,

is pharyngeal differing in this respect from the sore throat of measles, which is laryngeal, and from that of small pox which is both pharyngeal and laryngeal."

He described cases in which recovery seemed certain, but which on the 9th or 10th day of the attack suddenly developed severe cervical adenitis, rhinorrhoea, enlarged tonsils and other signs, bearing a strong resemblance to those of diphtheria.

As the larynx was at times invaded he was inclined to adopt the view, that there was super-added diphtheria.

He maintained that membranous scarlatinous sore throat remains confined to the pharynx and "has no liking for the larynx" while the diphtheritic affection has a special tendency to spread both downwards and into the nose.

Graves(9) quoted by Trousseau disagrees and cites cases of patients dying of croup, towards the close of an attack of scarlet fever, and also of cases recovering from this disease, after having coughed up false membrane from the larynx and trachea. It is interesting to contrast the opinions of two such eminent observers and at the same time there can be no doubt that the presence of laryngeal complications must have introduced a difficulty which for long helped to confuse the two diseases. Aided by modern bacteriological methods it is now much easier to decide whether diphtheria is present. Post-scarlatinal diphtheria is not uncommon as Trousseau maintained,

but he seems to ignore the possibility of a laryngitis special to scarlet fever.

On the other hand the picture that Graves describes appears very like diphtheria. Certainly casts of the trachea and larynx are very uncommon in the laryngitis of scarlet fever, and where they are seen in this disease they are very suggestive of superadded diphtheria.

Sir William Jenner[12] in his Gulstonian lectures delivered in March 1853, discussed the apparent causes of death in fatal cases of scarlet fever, which he had examined. In some of the cases, fatal during the first week, he noted sloughing of the tonsils and ulceration of the pharynx and larynx. In addition he observed an intense redness and a deposit of lymph upon the mucous membrane of the pharynx and larynx. In discussing the structural changes found in those cases fatal after the first week he made no reference to the larynx but observed pleurisy and pneumonia.

Henoch[10] gives the best and most thorough account of involvement of the larynx in scarlet fever.

He is in disagreement with Bretonneau's statement that "elle n'a aucune tendance à se propager dans les canaux aériferes." He gives notes of various cases in which the pharyngeal affection spread to the larynx and this in most instances was confirmed in the post-mortem room. In one which survived, after tracheotomy, membrane was discharged through the tracheotomy tube.

He found that the inflammatory process did not necessarily extend continuously through the upper air passages and was of opinion that "bronchial croup" in some cases was due to infective particles being inspired from the pharynx. Evidence in support of this was given in the case of a boy of 3 years in which the ulceration extended from the pharynx over the ary-epiglottidean ligaments as far as the true vocal cords, but there ceased, leaving the trachea unaffected. It was only in the bronchi that further evidence of the septic condition was seen, in the form of muco-pus. He remarks that implication of the laryhx usually causes mild symptoms, and in some of his cases the malignant symptoms of scarlet fever so predominated, as to cause him to overlook those of the laryngeal condition, which was only discovered in the post-mortem room. In only one instance in a girl of seven years did he observe marked tenderness on pressure over the larynx, as well as great hoarseness. These symptoms were due to perichondritis and gradually disappeared.

Morrell Mackenzie(16) states, "During the progress of this form of scarlet fever (scarlatina anginosa) the disease sometimes extends to the larynx, when the voice is modified, and, if the epiglottis is much inflamed, deglutition becomes difficult, and liquids regurgitate through the nose."

Most of the more recent text-books mention the possibility of the condition occurring. McBride[15], Yonge[28] and Moure[18] look upon it as a rare complication and mention both the membranous and ulcerative form. Welch and Schamberg[25], Goodall and Washbourne[7], von Jürgensen[24], and P. Watson Williams[26] all state that in some cases of scarlatina anginosa the larynx may become involved and intubation (Moure) or tracheotomy (Moure, Goodall and Washbourn) may be necessary. According to Welch and Schamberg perichondritis is a rare and fatal complication.

Moure and von Jürgersen found that in certain cases the septic process may spread still further down the respiratory passages into the lungs.

Ker[13] states that "laryngitis is an extremely rare symptom in scarlatina."

St.Clair Thomson[21] in his recently published book states, "the larynx is often invaded, with the production of oedema, of laryngeal perichondritis, necrosis of the cartilages and subsequent stenosis."

On reviewing the literature it is seen that with the exception of Henoch, none of the authorities treats the subject in any detail. However several main facts can be elicited.

1. Most authorities agree that cases with laryngeal implication in scarlet fever are furnished mainly by the anginose or septic type of scarlet fever.

2. The condition is rare. St.Clair Thomson makes the statement that the larynx is often invaded and is thus at variance with other observers. Bretonneau goes to the other extreme. It was his belief that the larynx was never invaded.

3. Pulmonary complications, according to Henoch, Moure and von Jürgersen may result from a further extension of the septic processes.

4. Goodall and Washbourn state that tracheotomy in some cases may be necessary. Moure makes mention of both intubation and tracheotomy.

TABLE I.

SIMPLE LARYNGITIS

Case	Year	Sex	Age	Condition of Fauces	Day of Onset of Laryngitis	Duration Days	Rhinorrhoea	Adenitis	Otorrhoea	Pulmonary Complications	Tracheotomy Early	Tracheotomy Late	Result
1	1903	F.	2	Congested	14	9.D. *	-	+	+	B.Pneumonia			D.
2	1905	M.	3	Congested	16	2	+	+	-				R.
3	1905	M.	3	Ulcerated	18	8	+	+	+	B.Pneumonia			R.
4	1906	M.	5	"	5	2.D.	-	+	-		+		D.
5	1906	F.	14	Congested	2	2.D.	-	-	-	~~Bronchitis~~ Pleurisy	+		D.
6	1907	F.	10/12	Ulcerated	4	14.D.	-	+	+	Bronchitis		+	D.
7	1908	M.	18	Congested	6	5	-	-	-				R.
8	1908	F.	3	Ulcerated	2	13	+	+	+				R.
9	1908	M.	5	Congested	2	2.D.	-	-	-				D.
10	1909	F.	4	"	15	15.D.	+	-	+	B.Pneumonia Pleurisy		+	D.
11	1909	M.	6	"	22	7	-	-	-				R.
12	1909	M.	6	Ulcerated	5	3.D.	+	+	-	Bronchitis			D.
13	1909	M.	5	"	27	10.D.	+	+	+	Bronchitis			D.
14	1909	F.	2½	"	5	17	+	+	-				R.
15	1909	F.	2	"	11	15.D.	+	+	-	B.Pneumonia	+		D.
16	1911	F.	6	Congested	8	1.D.	+	+	-				D.
17	1911	M.	8	"	1	6	-	-	-				R.
18	1911	M.	3	Ulcerated	17	5	+	+	+				R.
19	1911	M.	1½	"	4	1.D.	+	+	-				D.

* D indicates death of child.

TABLE. II.

ULCERATIVE LARYNGITIS.

Case	Year	Sex	Age	Condition of Fauces	Day of Onset of Laryngitis	Duration Days	Rhinorrhoea	Adenitis	Otorrhoea	Pulmonary Complications	Tracheotomy Early	Tracheotomy Late	Result
20	1904	F.	1½	Ulcerated	6	9.D.	+	+	—	B.Pneumonia	+		D.
21	1905	M.	10/12	"	7	2.D.	+	+	—	B.Pneumonia			D.
22	1905	M.	8	"	16	10.D.	+	+	—	B.Pneumonia			D.
23	1905	M.	3	"	?	? P.M.	+	+	—	L. & B. Pneumonia			D.
24	1906	M.	2	"	23	58	+	+	+	Bronchitis	+		R.
25	1906	M.	3½	"	11	5.D.	+	+	—	-			D.
26	1907	M.	1½	"	8	5.D.	+	+	—	-		+	D.
27	1907	F.	5	"	15	6.D.	+	+	—	B.Pneumonia			D.
28	1907	M.	5	"	31	31.D.	+	+	+	B.Pneumonia Empyema			D.
29	1907	M.	2½	"	?	? P.M.	+	+	—	B.Pneumonia Bronchiectasis			D.
30	1907	M.	5	"	?	? P.M.	+	+	—	B.Pneumonia			D.
31	1907	M.	8	"	10	8.D.	-	+	+	L.Pneumonia			D.
32	1907	M.	4	"	8	13.D.	+	+	—	L.Pneumonia		+	D.
33	1907	M.	2½	"	5	1.D.	+	+	—	B.Pneumonia			D.
34	1907	M.	5	"	?	? P.M.	—	+	—	B.Pneumonia			D.
35	1908	M.	1 9/12	"	10	1.D.	+	+	—	Bronchitis			D.
36	1908	F.	3	"	18	8.D.	+	+	—	Bronchitis			D.
37	1908	M.	10/12	"	10	13	+	+	+	-	+		R.
38	1910	M.	21	Ulcerative Stomatitis	18	26.D.	-	+	—	Bronchitis			D.
39	1910	F.	3	Ulcerated	10	5. D.	+	+	+	B.Pneumonia Pleurisy			D.
40	1910	M.	1 9/12	"	5	26	+	+	+	Bronchitis	+		R.
41	1912	M.	5 11/12	"	37	2.D.	+	+	—	-			D.

ANALYSIS OF CASES.

During the ten years referred to, 10,936 cases of scarlet fever were admitted to the Eastern Hospital and 41 cases of laryngeal implication occurred amongst them.

The patients were mainly children drawn from the lower classes. Many of them on admission were in a poorly nourished and neglected condition.

On examination of the clinical and post-mortem records the laryngeal cases resolved themselves into two groups:

I. Those in which the larynx was inflamed (simple laryngitis).

II. Those in which the larynx shewed evidences both of inflammation and ulceration (ulcerative laryngitis).

I have therefore arranged them in these two groups, Table I, representing simple laryngitis and Table II ulcerative laryngitis. The cases are numbered, and the year, sex, age and condition of the fauces noted. The time of onset and the duration are stated as far as they can be ascertained from the records. Rhinorrhoea, adenitis and otorrhoea are mentioned when they occur. In both Tables the cases in which tracheotomy was performed are divided into two groups: (a) early; (b) late, as I believe I can shew that to some extent surgical measures have an

influence upon the prognosis. This division is arbitrary. To group (a) belong those cases operated on within the first four days, and to group (b) those operated on any time after the fourth day. The recoveries and deaths are recorded.

The reports of the cases will be found in Appendix A.

TABLE I. SIMPLE LARYNGITIS.

No. of cases 19.

Yearly Incidence: One occurred in 1903, two in 1905, two in 1906, one in 1907, three in 1908, six in 1909 and four in 1911.

Sex: Eleven were males and eight females.

Age: Ten occurred in the first quinquennium, seven in the second, one in the third, and one in the fourth.

Condition of Fauces: Ten cases presented signs of ulceration.

Time of Onset: In four laryngitis was present on admission: in one of these the laryngitis occurred on the first day of the disease, in the remaining three on the second day.

Six, including these four cases, occurred before the fifth day, five between the fifth and tenth days, six between the tenth and twentieth days, and two between the twentieth and thirtieth days.

Duration: In seven the symptoms were present under five days, in six from five to ten days and in six from ten to twenty days.

Rhinorrhoea: Rhinorrhoea was present in eleven.

Adenitis: Adenitis was present in thirteen.

Otorrhoea: Otorrhoea was present in seven.

Pulmonary complications: Pulmonary complications occurred in eight cases; of these bronchitis was present in four, broncho-pneumonia in four, and pleurisy in two. It will be observed that some of these complications were co-existent.

Tracheotomy: Early tracheotomy was performed in three instances, and late tracheotomy in two.

Mortality: Eight recovered. Of ten cases in the first quinquennium five recovered; of seven in the second quinquennium two recovered. The one in the third quinquennium died, and the one in the fourth recovered. Four of the ten cases with ulceration, and four of the nine cases without ulceration of the fauces recovered.

All the cases on which tracheotomy was performed died. Mortality = 57.89 per cent.

TABLE II. ULCERATIVE LARYNGITIS.

No. of cases 22.

Yearly Incidence: One occurred in 1904, three in 1905, two in 1906, nine in 1907, three in 1908, three in 1910, and one in 1912.

Sex: Eighteen were males and four females.

Age: Fourteen occurred in the first quinquennium, seven in the second, and one in the fifth.

Condition of fauces: Ulceration of the fauces, varying in degree was present in twenty-one.

Time of onset: No cases occurred before the fifth day. Six occurred between the fifth and tenth days, nine between the tenth and twentieth days, and three after the twentieth day. In four cases involvement of the larynx was not diagnosed during life.

Duration: In four the symptoms were present under five days, in seven from five to ten days, in three from ten to twenty days, and in four for more than twenty days. The remaining four cases were discovered at the autopsy.

Rhinorrhoea: Rhinorrhoea was present in nineteen.

Adenitis: Adenitis was present in all.

Otorrhoea: Otorrhoea was present in six.

Pulmonary complications: Pulmonary complications occurred in eighteen. Of these broncho-pneumonia was found in eleven, bronchitis in five, lobar pneumonia in three, pleurisy in one, empyema in one, and bronchiectasis in one. Again it will be observed that some of these complications were co-existent.

Tracheotomy: Early tracheotomy was performed in four cases and late tracheotomy in two.

Mortality: Three, which all belonged to the first quinquennium, recovered. These three are included among the four cases on which early tracheotomy was performed.

Mortality = 86.36 per cent.

ANALYTICAL SUMMARY.

Incidence: The percentage incidence 0.37 is small. The condition is therefore rare, and this finding is not in accordance with the statement of St.Clair Thomson that "the larynx is often invaded" in scarlet fever.

During certain years the type of laryngitis varies. Thus in 1907 there were among my cases nine of ulcerative laryngitis, and one of simple laryngitis, whereas in 1909 there were six cases of simple laryngitis and no cases of ulcerative laryngitis. As McBride remarks, "in certain epidemics of scarlatina there

seems to be a special tendency for the larynx to become involved."

Sex: It will be noticed in this series of cases that while simple laryngitis is slightly more common in the male than in the female sex, ulcerative laryngitis is much more common in the male.

Age: Both forms of laryngitis are mainly confined to children under ten years of age. This is to be expected as scarlet fever mainly attacks those at this period of life.

Condition of fauces: Faucial ulceration, as all authorities recognise, appears to be a strong factor in the causation of the laryngeal complication, especially of the ulcerative form, for in all the latter except one the fauces were ulcerated; but in this exceptional case there was severe ulcerative stomatitis. Up to recent years it was not unusual to meet with numerous cases of scarlatina anginosa and, as laryngeal involvement is associated in the great majority of cases with this type, laryngitis was formerly of more ferquent occurrence than it is now.

Table III is compiled from cases admitted to the Metropolitan Asylums' Board Hospitals from 1903 to 1912 and is of interest in shewing the steady fall in the mortality of scarlet fever, and the almost corresponding fall in the occurrence of laryngitis. It

T A B L E III.

Year	Cases admitted	Cases of laryngitis	Percentage of laryngitis	No.of Deaths	*Case Mortality Rate
1903	10,993	27	0.24	333	3.10
1904	10,520	17	0.16	364	3.37
1905	16,326	31	0.18	536	3.27
1906	17,829	26	0.15	521	2.94
1907	22,096	28	0.13	622	2.80
1908	20,102	19	0.09	520	2.56
1909	16,191	22	0.13	371	2.40
1910	9,523	9	0.09	213	2.30
1911	8,438	13	0.15	167	1.9
1912	9,793	10	0.10	154	1.6

* Calculated according to Registrar General's formula.

will be seen that the mortality in 1903 was 3.1 per cent; in 1912 1.6 per cent; while laryngitis occurred in 1903 in 0.24 per cent and in 1912 in 0.10 per cent of the cases.

Time of onset: A comparison of Tables I and II shews that the time of onset of simple laryngitis is earlier than that of ulcerative laryngitis. I have set down in tabular form the periods of onset for contrast in order to demonstrate this point.

	Simple Laryngitis	Ulcerative Laryngitis.
Under 5 days	6	-
5 - 10 days	5	6
10 - 20 days	6	9
Over 20 days	2	3
Unknown	-	4

From these figures it will be seen that the majority of cases of simple laryngitis occurred within the first ten days, whereas the majority of cases of ulcerative laryngitis occurred after the first ten days of the disease.

Duration: Simple laryngitis is of short duration, but (the) ulcerative laryngitis is apt to be prolonged, as in the three cases which recovered, signs of inflammation and ulceration were present for 58, 13 and 26 days respectively.

Rhinorrhoea, Adenitis: Otorrhoea: Rhinorrhoea and adenitis are very common, and are naturally mostly confined to the severer cases - those cases which develop ulcerative laryngitis. Otorrhoea is not so common in this type as a fatal termination occurs early in the disease. All three cases of ulcerative laryngitis which recovered developed otorrhoea.

Pulmonary complications: Pulmonary complications are common and especially so in the ulcerative form.

Tracheotomy: Early tracheotomy was performed on all cases of ulcerative laryngitis which recovered, a fact which points to the advisability of early operation.

Mortality: The prognosis is very grave. In the present series thirty died, giving a ratio per cent. of 73.17. It is thus a most serious complication.

In view of these facts it is surprising to find so little attention devoted to it.

BACTERIOLOGY, PATHOLOGY AND MORBID ANATOMY.

Our present knowledge of the bacteriology of scarlet fever is unfortunately limited. The balance of opinion is in favour of an infection akin to that of the streptococci. Klein[14] in 1887 isolated a streptococcus (streptococcus scarlatinae) from a certain percentage of cases in the acute febrile stage as well as later in the disease. He maintained that the streptococcus was the primary cause of the scarlet fever, but other observers were of opinion that it was responsible only for the purulent changes present, indicating secondary infection.

Mervyn Gordon[8] from his researches described various streptococci, among them the streptococcus conglomeratus of Kurth.

Class[3] in 1889 described a coccus, somewhat resembling a large gonococcus, which he stated was invariably present in the throat secretions, blood and scales of patients suffering from scarlet fever.

Mallory[17] in 1904 discovered protozoon-like bodies which he obtained from the skin of four scarlet fever patients. He was however unable to produce any evidence shewing their etiological relationship to scarlet fever.

As matters stand at present it is impossible to accept any of the above till more proof has been

brought forward to shew their connection with the disease.

Whatever the cause there is reason to believe it produces necrotic changes in the tissues which lay the parts open to superadded infection by other micro-organisms especially the streptococci and to a less extent the staphylococci.

Henoch was an advocate of the teaching which made the tendency to necrotic processes one of the chief features of scarlet fever.

According to Welch and Schamberg,(25) "In normal scarlatina the larynx is exempted, and the mucous membrane, being in a healthy state, is not particularly susceptible to the noxious influence of the streptococcus." Cultures from the mouth and throat invariably consist of the various forms of streptococci and staphylococci. Cultures from laryngeal ulcers also consist of the same micro-organisms, and the ulceration both of the larynx itself and the tracheotomy wound is suggestive of streptococcal and staphylococcal infection.

It is reasonable to expect that if the ulceration in the fauces is presumably due to these organisms, that that in the larynx will also be due to the same cause. It is important to note that Vincent's organisms have been found in laryngeal ulcers in scarlet fever. (Case 38) This case has already been published by Goodall.(6)

However as long as we are in the dark concerning the actual cause of the disease, it is impossible to make any further statements, even as regards the larynx as to how the toxin acts apart from the influence of the pus-producing cocci and other micro-organisms.

Burnett(2) remarks that it is probable even in the ordinary mild cases of scarlet fever that there are often certain changes present in the larynx, as is demonstrated by hyperaemia and slight catarrh of the mucous membrane. He quotes Klein who found peculiar changes present in the lymph follicles of the tonsils, pharynx and larynx. In these cases the laryngeal affection is as a rule of moderate severity and of simple form as is shown by the absence of any symptoms of the nature of hoarseness, cough and difficulty in breathing. In the milder forms of scarlatinal laryngitis there is found post-mortem a reddening and slight swelling of the laryngeal mucous membrane, (Cases 6, 9, 10, 15). The injection may extend down the trachea (Cases 6, 9).

The lining mucous membrane in more severe cases is usually found to be acutely inflamed. In some cases a flaky white secretion is present (Case 5); in others almost a definite membrane.

The inflammatory condition is frequently most noticeable in the region of the vocal cords and epiglottis.

The trachea may also be implicated from direct extension and may be covered with the same mucous exudate (case 5). In more severe cases the epiglottis, along with the inflamed mucous membrane of the larynx, may be much reddened, roughened and thickened, especially on the laryngeal surface. A pseudomembranous exudate may be present in the worst type of case, but this usually accompanies ulceration (cases 23, 33, 34). In three instances (cases 5, 17, 32) the presence of membrane, during life, was observed.

Without doubt the early form of laryngitis usually precedes the ulcerative form (case 5). Both types are undoubtedly secondary and in the case of the ulcerative type a direct continuity of the ulcerative process may be noted. It is sometimes seen that the extension takes place downwards to the pyriform fossae, and from thence into the larynx (cases 29, 30, 31, 35).

In most cases if not in all, the faucial lesion is very severe; for it is this type of case that is most frequently encountered in the post-mortem room. Post-mortem the ulcers are found in various regions of the larynx and are of various types.

In all the cases there was ulceration on or above the cords; in four there was in addition ulceration below the cords. In two of these cases the ulcerative process could be traced by continuity from the

upper half of the larynx to the lower half (cases 29, 31). In the other two there was no direct connection (cases 22, 32).

The ulcers were found most frequently upon the epiglottis (cases 21, 29, 30, 31, 32, 34, 35, 38, 41) and vocal cords (cases 20, 23, 28, 32, 33, 34, 39, 41) less frequently upon the arytenoids (cases 22, 35, 38) and still less so upon the aryteno-epiglottidean folds (case 31) and the cricoid (case 31) and thyroid cartilages. In twenty-one cases examined ulceration was found in fifteen instances upon the epiglottis; in thirteen upon the vocal cords; in four upon the arytenoids; in two upon the aryteno-epiglottidean folds; in two upon the cricoid cartilage; and in one upon the thryoid cartilage.

The ulcers may be of small size, multiple or single. On the other hand they may be large and extensive, but in most cases superficial. In others again the process may be deep enough to expose the cartilage (cases 22, 38). Extensive sloughing of the mucous membrane and underlying tissue sometimes takes place, in the form of dirty greenish sloughs (case 30). The larynx in the more healthy parts is deeply injected (cases 23, 31), and this injection frequently extends down the trachea as far as the bifurcation where it is most intense (cases 31, 41). In some cases the area in contact with the tracheotomy

tube

if tracheotomy has been performed may shew extensive superficial ulceration (cases 6, 10). On the other hand in certain instances ulceration of the trachea may occur in cases in which tracheotomy has not been performed (cases 22, 32). In addition to the ulceration there is swelling of the mucous membrane to a greater or less extent. The ulceration as previously stated may be deep exposing cartilage and setting up a limited perichondritis.

Welch and Schamberg (25) quote Kraus who states that "perichondritis is extremely rare occurring once in 200 to 250 cases of scarlet fever". They also state that "Rauchfuss saw four cases among 903 cases of scarlatina and Leichenstern two cases among 467".

In none of the cases which I have investigated has there been any evidence of severe perichondritis; nor was there any appearance of an external abscess such as is described in connection with enteric fever. This is probably accounted for by the early death of the patient.

Oedema of the larynx, although very rare, is sometimes found. The swelling is most marked in the region of the arytenoids and aryteno-epiglottidean folds and to a less extent over the epiglottis and vocal cords (cases 12, 21, 23, 38).

This is in accordance with the observations of

Logan Turner who has shewn that the mucous membrane is but loosely attached in the neighbourhood of the arytenoids, the ary-epiglottic folds and the ventricular bands; and that therefore oedema of these parts is more liable to occur. In one of these cases (case 38) there was coincident albuminuria, but there was no doubt that the oedema was connected with the septic state of the mouth and throat.

In those cases which arrive in the post-mortem room broncho-pneumonia is usually present, and pus can usually be squeezed from the smaller tubes. Much less common is lobar pneumonia with or without broncho-pneumonia.

Other pulmonary complications which may occur, are septic bronchotis, pleurisy with effusion, empyema and bronchiectasis.

A condition (illustrated by the case in Appendix B.) which may follow upon ulceration, if the child survives, but which is fortunately very rare, is that of stenosis of the larynx.

The rarity of this condition probably depends upon the fact that cases with extensive ulceration are usually rapidly fatal. Owing to the softness of the laryngeal walls and the small size of the air passages in children, stenosis may occur with comparative ease. It may be due either to sprouting granulations or to cicatricial contraction with distortion of the parts. There are no cases of this condition in the present series.

S Y M P T O M A T O L O G Y.

The symptoms which occur in the laryngitis of scarlet fever are largely similar to those which occur in any case of severe laryngitis. There are, however, many points which require special mention.

It would at first be as well to consider a typical case shewing this complication, and afterwards to draw attention to various special points of interest. The onset, which may occur comparatively early in the disease, is usually characterised by a slight irritating cough, hoarseness, partial loss of voice, and restlessness. Deglutition may be slightly interfered with. The respirations are increased in frequency and there is present a certain amount of inspiratory stridor. The patient gradually becomes more and more restless, - tossing about the bed, - with increasing dyspnoea followed by some cyanosis. The symptoms become more marked. The dyspnoea, at times paroxysmal, progresses and the recession may become considerable. The temperature remains high, ranging from 100^{0} - 104^{0} and the pulse is rapid, weak and compressible. The face which at first is pale, gradually assumes a dusky tinge, but never becomes so deeply cyanosed as in severe laryngeal obstruction. At the same time the

act of swallowing leads to violent coughing and retching. Ordinary feeding by mouth becomes increasingly difficult. The condition is now one of great gravity, and warrants the consideration of immediate surgical interference.

The difficulty in swallowing, already present, is now aggravated. As time wears on the embarrassment to breathing continues and the dyspnoea and cyanosis become constant.

Increasing weakness resulting from the combined influences of loss of sleep, defective nutrition, and exhaustion of the nervous system, is soon responsible for a fatal termination, which may take place comparatively suddenly.

In the special case which we are considering, several points in addition may be particularly mentioned. In the first place I would like to call attention to the fact, observed by Henoch, that symptoms even in a severe case may be slight, or even absent. Several cases have been found on examination in the post-mortem room to have extensive laryngitis without any indication pointing to involvement during life (cases 23, 29, 30, 34). No doubt the absence of symptoms is accounted for by the extreme exhaustion of the patient.

In scarlatina anginosa one may meet with mild laryngitis characterised by few symptoms, and which

may not have any influence on the final issue. In the majority of cases, of laryngitis in scarlatina anginosa, however, the symptoms are of a much more severe type, and in such cases are marked by their gradual development in contradistinction to acute laryngeal obstruction.

Local signs are usually absent. If any are present they are difficult to elicit owing to the youth of the patient and his general condition. Laryngoscopic examination is practically impossible in such cases occurring in children. Nor in such cases is there much information to be gained from digital examination, even if it were advisable. Any benefit gained is counteracted by the bad effect on the child.

D I A G N O S I S.

In some cases of laryngitis the diagnosis is easy, but in other cases it may be a matter of great difficulty.

As previously mentioned extensive ulceration of the larynx has been discovered post-mortem although no symptoms were presented during life.

In scarlet fever in particular I may lay stress upon one condition which occurs, and gives rise to considerable difficulty in diagnosis. A child, suffering from severe scarlet fever, who has large and inflamed tonsils and inflammation and swelling of the nasal passages may sooner or later develop respiratory obstruction. Normally a child on falling asleep breathes through its nose, but with the above-mentioned condition present he is forced to rely on oral breathing, which itself is defective owing to the swelling of the fauces. The airway is thus considerably diminished and the child sits up in bed with head hanging forwards and mouth open. If any attempt is made to place him in the recumbent posture he struggles back to his former position obviously owing to the fact that the falling back of the tongue causes additional obstruction. For the same reason he resists falling off to sleep. As a result of these difficulties in breathing the child

gets more and more exhausted, the muscular act of respiration is accompanied by retraction of the least resistant parts of the chest wall and he gradually becomes cyanosed.

In the presence of such a condition the want of sleep and restlessness soon produce a profound toxaemia and tracheotomy is a valuable remedy if not delayed too long. (Henoch; Stewart(20)). To distinguish this condition from laryngitis requires a general consideration of the case, always remembering that laryngitis occurring in conjunction with this state of affairs may easily escape recognition.

Post-pharyngeal abscess: Another condition analogous to this and presenting much the same mechanical obstruction is that of post-pharyngeal abscess. It is surprising how frequently post-pharyngeal abscess is diagnosed as obstructive laryngitis.

Cough, dysphagia, and dyspnoea extending over a period of some days are common to both. The voice is thick and at times almost lost. The question of diagnosis can be readily dismissed by digital examination of the pharynx, which under the circumstances is advisable. Any post-pharyngeal swelling can be readily detected by the finger. The possibility of both conditions occurring together must be borne in mind. (Case 28)

Diphtheria: Laryngeal symptoms in scarlet fever are very frequently due to infection with the diphtheria bacillus. If a definite membrane is seen in the nose or throat or is coughed up, the evidence of diphtheria is strongly positive.

A bacteriological examination is in all cases essential. This is so important that a smear should be examined at once and a cultivation taken. If the bacillus is found either in the throat or in the nose there is strong presumptive evidence of the same organism being the cause of the laryngitis.

The effect of diphtheria antitoxin in causing the symptoms to clear up rapidly is distinctly suggestive.

Measles: The laryngitis which so frequently accompanies the onset of measles should be readily distinguished. The coryza and conjunctivitis are suggestive and the Koplik's spots are pathognomonic. The Koplik's spots are particularly helpful as they appear so early in the disease.

A septic rash in scarlet fever presents appearances very similar to the rash of measles. The history and progress of the case will clear up the matter in a day or two.

Oedema glottidis (non-inflammatory): Non-inflammatory oedema as a result of nephritis may occur in scarlet fever. The symptoms are not so urgent as in the inflammatory type. A history of the case combined with an examination of the urine will be sufficient to clear up the diagnosis.

Broncho-pneumonia: The difficulty as regards broncho-pneumonia lies in the fact that the complication may exist prior to the onset of the laryngitis. The existence of broncho-pneumonia can usually be detected by an examination of the lungs, but the urgent dyspnoea with pulmonary distress may tend to mask the signs of any superadded laryngitis. Little difficulty should be experienced in distinguishing between the two conditions when occurring independently, or where the broncho-pneumonia is secondary to the other. In the final stages of broncho-pneumonia the symptoms of asphyxia may be very prominent and thus present a picture very similar to that of laryngeal obstruction. Indeed the presence of any acute lung condition, such as empyema or double lobar pneumonia might present the same diffiuulty.

Laryngismus Stridulus: It is possible that laryngismus stridulus may occur. The attack is short and in the intervals between the spasms there is no hoarseness or cough such as is present in laryngitis.

The symptoms with the long crowing inspiration terminating the attack are characteristic. Furthermore one will usually find the evidence of a general constitutional disease, such as rickets.

Foreign body in the larynx: In the case of a foreign body in the larynx the history of the case will aid greatly in the diagnosis.

P R O G N O S I S.

The immediate prognosis as a general rule must be guarded, even in those cases with few symptoms and comparatively little faucial ulceration. The mortality depends to some extent upon the nature of the epidemic.

The age of the child does not appear to influence the prognosis adversely for all three cases of ulcerative laryngitis which recovered were under 2½ years of age. A favourable termination or otherwise also depends upon the severity of the attack of scarlet fever, the extent of the impairment of the general health and the extent of the local lesion with its subsequent complications. The prognosis in cases of mild scarlet fever, with few laryngeal symptoms is usually good and many of these cases will recover in a few days with little treatment. The prognosis is necessarily influenced more by the general condition. The most serious cases are those in which the ulceration in the fauces is extensive and spreading, and where the restlessness, delirium, stridor, hoarseness and recession are marked. Inability or disinclination to swallow food also militates against recovery, and in its violent antipathy to nasal feeding the strength of the child gradually begins to lessen.

Prompt treatment in the form of operative measures has a considerable influence upon the favourable course of the case.

The chances of recovery appear to be more favourable if tracheotomy is performed before the symptoms have become too alarming and before the child has become too exhausted.

If the symptoms progress and the child is not afforded relief the laryngeal obstruction added to the general septic condition presages a speedy termination of the disease. In exceptional cases acute oedema of the glottis may supervene. Should any lung complications occur the prognosis necessarily becomes more grave. In cases which recover stenosis as a sequela may give rise to considerable trouble.

T R E A T M E N T.

The treatment of scarlatina anginosa and its varied results is frequently a question of considerable complexity and much difference of opinion still exists as to the best means to be adopted. Many of the remedial measures described in the following pages are those which experience in this hospital has shewn to be of value and which have gradually become adopted as the best means of offering the patient a chance of recovery. The treatment of these cases under consideration has to be considered in relation to the condition of the fauces, to the general condition, and to the occurrence of the laryngeal complication.

The essential objects to be aimed at are:-

I. The prevention of septic spread to the larynx and the destruction of the organisms, or the diminution of their infective power, as far as possible, at the site of infection.

II. The stimulation of the body against the organisms and their products and the destruction of the organisms in the blood stream.

III. Local laryngeal measures:

(a) Palliative.
(b) Operative.

I. Local Treatment of the Fauces: As faucial inflammation varying in degree so often precedes the laryngeal affection great importance must be attached to the local treatment of the fauces. The object of all forms of local treatment is to limit the growth of the micro-organisms and thus prevent the further spread of infection in other directions. This is done as far as possible by the destruction of the organisms and the stimulation of the local wound reaction of the tissues. As yet we cannot rely upon any antiseptic which will completely destroy the organisms and at the same time is harmless to the living tissues. However by means of antiseptic lotions the spread of infection may be limited to a certain extent. The mouth should be carefully attended to, and the teeth regularly cleaned. Free irrigation of the fauces is often very helpful. Various antiseptics such as chinisol, izal, perchloride of mercury, carbolic acid, chlorine water etc. have been advised, but in my opinion some simple lotion such as boric lotion has its advantages in that it is soothing and non-poisonous. On the other hand swabbing gently and carefully performed is most serviceable in limiting the spread of inflammation.

Signs of laryngeal involvement occurring in the absence of any improvement in the throat condition call for more active treatment. With the aid of a

mouth gag and tongue depressor the ulcerated surfaces should be swabbed over with pure izal. The application of pure phenol, as advised, appears to me to be too drastic.

In addition to the local treatment applied to the fauces, other complications such as rhinorrhoea otorrhoea and cervical adenitis should receive attention.

II. General Treatment: In spite of many therapeutic measures which have been tried in scarlet fever we cannot yet lay claim to any efficient means whereby the course of infection can be cut short or controlled in any way. In all cases of severe infection the maintenance of the strength of the patient is of great importance and to ward off debility and exhaustion by every possible means is our chief aim. I do not consider it advisable, within the bounds of this paper, to discuss minutely the general treatment of the patient as regards dieting beyond remarking that the diet must be abundant and nutritious. It is best given in the form of fluids and stimulants are nearly always required owing to the danger of cardiac failure. It would be as well however to emphasise the value of nasal feeding. In fact in all cases of severe ulceration of the fauces with or without ulceration of the larynx nasal feeding should be considered at an early stage.

By this method of feeding we remove a considerable source of irritation to the inflamed fauces and also prevent septic material being carried into the stomach. In the presence of laryngitis nasal feeding is absolutely essential owing to the pain in swallowing and the danger of food material passing into the respiratory tract.

Other measures in connection with the general treatment may be shortly mentioned. For the purpose of combating the pyrexia, the restlessness and delirium and the consequent nervous exhaustion, hydrotherapeutic treatment may be employed in the form of four hourly tepid sponging. In some instances hypnotic drugs are necessary. Brandy with hot water and sugar is an excellent remedy for sleeplessness in children. Failing this chloralamid, veronal, or adalin may be tried, or if necessary one must resort to opium. Sleep must be obtained for the patient even at the cost of some depression.

It is unfortunate that no specific treatment for scarlet fever has been introduced. Anti-sera and vaccines have been prepared from streptococci taken from cases of scarlet fever but unfortunately no really substantial benefit appears to have resulted from their use. Various observers however have reported encouraging results (Palmirski[19]: Zebrowski.[29])

H. Cumpston (4) treated thirty-seven cases of scarlatina anginosa with polyvalent anti-streptococcic serum. From the results he concludes that the serum, if given early, - as soon as signs of septic infection occur, - has a decidedly beneficial effect upon the majority of cases. Anti-streptococcic serum was used in several of the cases which form the subject of this paper.

III. Local Laryngeal Measures:

(a) Palliative Treatment: In the slight forms of laryngitis there is a tendency to spontaneous recovery in the course of a few days. One may meet with moderately severe laryngitis in mild scarlet fever which requires more active measures. The palliative treatment which I am about to describe may be employed.

The aim of palliative treatment is to rest the larynx as much as possible, to soothe the mucous membrane and to control muscular spasm. The child should be kept as quiet as possible and receive the undivided attention of the nurse. All food and drink should be given warm. He should be propped up in the position in which he breathes with the greatest ease, and no attempt should be made to fasten him down. Linseed poultices applied to the neck are useful in relieving

pain and at the same time in limiting the free movement of the neck, if properly and firmly applied. The only available method in these cases of bringing medicaments in contact with the mucous membrane of the larynx is by means of inhalations. The old fasioned steam tent can be employed. The vitiation of the air may be avoided by allowing pure oxygen from a cylinder to escape into the tent for a few minutes every hour. Various substances such as Tinct. Benz. Co., Ol. Eucalypt., and Ol. Pini. Sylv. may be introduced into the bronchitis kettle in order to impregnate the steam.

In the early stages Tr. Aconiti in small doses is of service. Other medicines which act as diaphoretics, and antiphlogistics are recommended, but little reliance can be placed upon them. Under this method of treatment the symptoms in many cases will clear up, but in other cases more active treatment is necessary.

(b) Operative: The question with which we now have to deal is that of laryngeal obstruction. This complication arises sooner or later in any case of severe laryngitis and the moment for interference is a question requiring great discrimination and consideration. If delayed too long much of the value of the operation is lost. In my opinion while in acute laryngitis occurring independently of septic inflammation of the throat one is justified in watching the progress of the patient before deciding upon interference, yet in

cases of laryngitis following upon this condition, delay is a mistaken policy. The earlier the operation the greater the chance of success. While there may be a variance of opinion in the early stage there can be no doubt as to its absolute necessity in the presence of progressive asphyxis.

There are some who would raise the objection that this treatment will lead to further complications of the nature of cellulitis of the neck and ulceration of the trachea. Undoubtedly these conditions do occur in cases left too long, but this is another reason for early interference. But again even in such cases operation will render the end easy and painless. The improved supply of fresh air to the lungs with consequent rest and sleep is of great benefit, under any circumstances, to the patient.

Two methods of operation may be discussed.

(1) Intubation.
(2) Tracheotomy.

(1) <u>Intubation:</u> At the Eastern Hospital intubation is a favourite operative measure in cases of laryngeal diphtheria and the laryngitis of measles so that I have had abundant opportunities of studying this treatment. However in cases of septic laryngitis and more particularly in oedematous laryngitis intubation is never practised for several reasons. In the for-

mer the tube is a constant source of irritation to the ulcerated mucous membrane. The child will not tolerate it. In the latter the introduction of the tube may tear the swollen tissues and lead to a very intractable form of ulceration. In oedematous laryngitis also the swelling of the mucous membrane may be so considerable as to block the inlet of the tube. In neither case is the air supply to the patient much improved. It must be mentioned however that Woodward (27) in Choyce's "System of Surgery" recently published, recommends intubation in preference to tracheotomy, in the presence of oedematous laryngitis not too advanced. Apart from any other objection, operations via the mouth are strongly contra-indicated in such cases owing to the trauma which may be easily caused.

(2) Tracheotomy: Tracheotomy is certainly the operation of election. It is better performed without an anaesthetic. From my own experience anaesthetics are inadvisable in tracheotomy. They tend to depress the already exhausted patient, and there is no doubt that the larynx in its diseased condition is easily irritated by the vapour of the anaesthetic, so that sudden spasm may occur at any moment. The onset of this necessitites the hurried opening of the trachea under adverse circumstances. After the skin incision is made, practical experience teaches one that there

is little if any pain associated with the operation. The above is in contra-distinction to the teaching set forth in many of the text books.

There are two common methods of performing tracheotomy.

(1) Stab Method.
(2) Dissection Method.

The stab method must be employed in all operations of emergency, but wherever possible the dissection method is to be preferred. The advantages of the dissection method are:-

(1) The prevention of blood escaping into the air tract.
(2) The avoidance of any misadventure.

If the cutting operation is performed layer by layer, then the trachea is well exposed before being incised. One can thus avoid any unnecessary injury to the tracheal wall and the opening in the trachea being evident to the naked eye renders the introduction of the dilators and tracheotomy tube much more easy. The "low" operation should be chosen as it is as well to have the incision as far as possible from the inflamed area in the larynx. After the operation the wound is treated in the ordinary way and covered with some antiseptic gauze. The tube should not be removed more often than is necessary for the purpose

of cleansing it. On the other hand one must keep clearly in mind the advisability of removing the tube as early as possible.

After tracheotomy the necessity for nasal feeding becomes still more urgent. It is a great mistake to wait for the appearance of food material in the tracheotomy tube.

Before leaving the subject of tracheotomy it would be as well to make a few remarks on the complications which may arise as a result of the operation in cases of scarlet fever. It is difficult to prevent the wound becoming septic so that inflammation of the skin and surrounding tissues is not at all uncommon. Cellulitis of the neck and abscess in the neighbourhodd of the trachea may result (case 10.) These are treated on ordinary surgical lines. Surgical emphysema is at times described in connection with tracheotomy, but is not as a rule of serious import. A complication likely to occur is that of ulceration of the trachea, occasionally seen in the postmortem room. The ulceration is generally situated at points where the tracheotomy tube has come in contact with the mucous membrane. The mere pressure of the tube on the intensely inflamed tissues is sufficient to cause this condition which may be extensive. Several of the cases here described gave considerable difficulty in

the removal of the tube, and possibly some degree of ulceration was responsible. Vulcanite and rubber tubes have been tried as substitutes for the silver tubes, but are of little avail in relieving the condition. It is conceivable that stenosis of the trachea might result, but I have no record of such post-mortem.

Cicatricial Stenosis of the Larynx: If stenosis should occur the treatment is practically the same as the treatment of stenosis in any other passage of the body. Dilatation or in some cases a cutting operation is necessary. Dilatation is performed by the aid of bougies of which a modern variety is Schrotter's. It can be equally well performed by the use of intubation tubes. At best the treatment is very tedious and unsatisfactory. One must remark however that American authorities report brilliant results in similar cases which occur after operative interference in laryngeal diphtheria. Should all attempts at dilatation fail, the last resource is thyrotomy which permits of the direct treatment of the scar tissue. Unfortunately despite all treatment the prospect of the patient having to wear a tracheotomy tube permanently is very strong. I have not thought it necessary to enter into the treatment of this complication in any

detail as the treatment belongs more to the province of the specialist. However I have thought it of interest to set forth in full the particular circumstances of a case which was treated at the Eastern Hospital for laryngeal stenosis after scarlet fever, and was afterwards transferred to Guy's Hospital for further treatment. An account of the case, abstracted from Guy's Hospital Gazette, will be found in Appendix B. As far as I know it is the only recorded instance of laryngeal stenosis following upon scarlet fever.

C O N C L U S I O N S.

(1) Laryngitis in scarlet fever is rare, occurring in 0.37 per cent of the cases in this series.

(2) The affection is chiefly confined to children under 10 years of age.

(3) Simple laryngitis occurs in both mild and septic scarlet fever, ulcerative laryngitis only in the septic type.

(4) Simple laryngitis occurs early, ulcerative laryngitis later in the disease.

(5) Pulmonary complications are common in simple laryngitis, but are almost a constant feature in ulcerative laryngitis.

(6) In severe forms of simple laryngitis and in ulcerative laryngitis early tracheotomy probably offers the best chance of a successful termination of the case.

(7) The mortality (57.89 per cent) among cases of simple laryngitis, is large, but is much larger (86.36 per cent) among cases of ulcerative laryngitis.

B I B L I O G R A P H Y.

1. Bretonneau: Memoirs on Diphtheria. The New Sydenham Society's Translation 1859, p.109.

2. Burnett: System of Diseases of the Ear, Nose and Throat, 1893. Vol.II, p.624.

3. Class: Allbutt and Rollestom. System of Medicine, L.S. Dudgeon, 1906, Vol.II, pt.I, p.421.

4. Cumpston: Quoted by Goodall. The Medical Annual, 1909, p.512.

5. Fothergill: A complete Collection of the Medical and Philosophical Works of John Fothergill. Account of the Putrid Sore Throat, 1781, p.221.

6. Goodall: M.A.B. Annual Report. Med. Supp. "Three Cases Bearing on Vincent's Angina," 1909, p.245.

7. Goodall & Washbourn: Infectious Diseases 1908, p.72.

8. Gordon, M.H. L.G.B. Med. Officers' Report 1900-1901, App. B. No.3, p.353.

9. Graves: Trousseau's Clin. Med. The New Sydenham Society's Translation 1869. Vol.II, p.179.

10. Henoch: Lectures on Children's Diseases. The New Sydenham Society's Translation, 1889, Vol.II, p.217-220.

11. Huxham: An Essay on Fevers etc. 1769, p.281

12. Jenner, Sir William: On Fevers and Diphtheria 1849-1879. Gulstonian Lectures on the Acute Specific Diseases, 1893, p.442.

13. Ker: Infectious Diseases, 1909, p.383.

14. Klein: L.G.B. Med. Officer's Report 1887 App. B. No.1, p.203.

15. McBride, P. Diseases of the Throat, Nose and Ear, 1900, p.136.

16. MacKenzie, Morrell A Manual of Diseases of the Throat and Nose 1880, Vol.I, p.187.

17. Mallory: A System of Medicine, Osler & McCrae, J. H. McCollom, 1907, Vol.II, p.341.

18. Moure, E.J. Diseases of the Pharynx and Larynx, translated. 1909, p.391.

19. Palmirski: Quoted by Burney Yeo, Med. Treatment 1913, Vol.II, p.650.

20 Stewart, W.J.J. M.A.B. Annual Report. Med. Supp. "On the Value of Tracheotomy in Certain Cases of Septic Scarlet Fever, 1898, p.176.

21. Thomson, Sir St.Clair Diseases of the Nose and Throat, 1912, p.670.

22. Trousseau: Trousseau's Clin. Med. The New Sydenham Society's Translation, 1869, Vol.II, p.179.

23. Turner, A. Logan: Ed. Med. J. 1902, N.S. XI, p.147.

24. von Jürgersen Diphtheria, Scarlet Fever and Measles. Nothnagels Encyclopaedia of Pract. Med. Eng. Ed. 1902, p.500.

25. Welch and Schamberg Acute Contagious Diseases 1905, Ps. 380, 396, 427.

26. Williams, P. Watson: Allbutt and Rollestom System of Medicine 1906, Vol.IV, Part I, p.296.

27. Woodward: A System of Surgery: Choyce, 1913. Vol.I, p.301.

28. Yonge, E.S.: A Handbook of the Diseases of the Nose and Throat, 1909, p.380.

29 Zebrowski: Quoted by Burney Yeo. Med. Treatment 1913, Vol.II, p.650.

A P P E N D I X A.

CLINICAL NOTES

- of -

C A S E S.

CASE 1. N.B. Female, aet. 2 years.

Date	Day of disease	
30 Dec.1903	1	Rash; vomiting.
31 " "	2	Admitted. On admission fauces injected; general punctate erythema; cervical glands enlarged.
4 Jan.1904	6	Slight spasmodic cough; right otorrhoea.
12 " "	14	Cervical glands on right softening; cough croupy; slight intercostal recession but no cyanosis.
14 " "	16	Recession more marked; dyspnoea.
16 " "	18	Fauces red and swollen; cough less frequent; cervical swelling on right incised and pus evacuated.
20 " "	22	Respirations rapid and irregular; no cough; slight intercostal recession; broncho-pneumonia at right base.
21 " "	23	Died at 2.30 a.m.

No post mortem.

CASE No.2: A.P. Male, aet 3 years.

28 Mar.1905	1	Rash; sore throat; admitted. On admission fauces congested; general punctate erythema.
12 Apr. "	16	Cervical glands enlarged; profuse rhinorrhoea; voice hoarse and cough croupy.
13 " "	17	Signs of laryngitis still present.
14 " "	18	No laryngeal symptoms.
8 May "		Discharged well.

CASE No. 3. H.L. Male, aet. 3 years.

Date.	Day of disease.	
19 May 1905	1	Sore throat.
20 " "	2	Rash; admitted. On admission fauces congested; general punctate erythema.
22 " "	4	Fauces ulcerated; profuse rhinnorrhoea; enlarged cervical glands.
29 " "	11	Otorrhoea; temperature 100 - 104°.
5 June "	18	Perforation of left anterior pillar of fauces; aphonia and harsh cough.
7 " "	20	Hoarseness more marked; recession of chest walls; dyspnoea; signs of broncho-pneumonia at left base; cervical abscess opened.
12 " "	25	Laryngitis much improved; temperature normal.
2 Aug. "		Discharged well.

CASE No. 4. E.D., male, aet. 5 years.

4 Oct. 1906	1	Sore throat.
5 " "	2	Rash; admitted. On admission fauces congested; tonsils ulcerated; cervical glands enlarged; general punctate erythema.
7 " "	4	Rhinorrhoea; fauces more swollen.
8 " "	5	Croupy cough.
9 " "	6	General condition very poor; child pale and in great distress. In afternoon patient suddenly became much worse with signs of laryngeal obstruction; tracheotomy was immediately performed but death occurred fifteen minutes later. No post mortem.

CASE No.5. M.H., female, aet.14 years.

Date.	Day of disease.	
16 Dec.1906	1	Sore throat.
17 " "	2	Croupy cough.
18 " "	3	Rash; admitted.
		On admission mouth and pharynx covered with sordes and mucus; general punctate erythema; laryngeal stridor; marked cyanosis and restlessness; child semi-conscious.
		Tracheotomy under chloroform performed and membranous cast removed (organisms - streptococci and staphylococci); relief considerable but not complete, diphtheria antitoxin 18,000 units administered. Temperature 105°. At 3 p.m. breathing very distressed and patient restless and cyanosed. Tube changed with but slight relief and patient died at 4 p.m. Membrane examined; no evidence of K.L.B. ~~only~~ many streptococci.

POST MORTEM.

Fauces: No signs of ulceration.

Larynx: Acutely inflamed with flaky white secretion present on the whole of the interior: no membrane.

Trachea: Covered internally by the same white secretion: no membrane.

Slight superficial ulceration on epithelium of both larynx and trachea.

Lungs: Bronchitis and pleurisy.

CASE No. 6. V.S. Female aet. 10 months.

Date.	Day of disease.	
14 Aug. 1907	1	Rash; admitted. On admission fauces inflamed and swollen; cervical glands enlarged; general punctate erythema.
17 " "	3	Respirations rapid; voice hoarse.
21 " "	7	Very croupy; stridor; fauces ulcerated.
25 " "	11	Ulceration spread to hard palate; frequent attacks of dyspnoea, stridor and recession; colour poor, and patient very restless. Low tracheotomy performed but no improvement.
26 " "	12	Bronchitis.
30 " "	16	Death at 2 p.m.

POST MORTEM.

Fauces: Much ulcerated but showed signs of healing.

Larynx and Trachea: Mucous membrane swollen and reddened and in region of tracheotomy wound was some shallow ulceration.

Lungs: Congested; bronchial tubes full of thick tenacious muco-pus.

CASE No. 7. H.H. male aet. 18 years.

Date.	Day of disease.	
11 Feb. 1908	1	Rash; admitted. On admission fauces congested; general punctate erythema.
16 " "	6	Voice husky; cough slightly croupy.
18 " "	8	Voice and cough much the same.
20 " "	10	Symptoms of laryngitis subsided.
9 Mar. "		Transferred to convalescent hospital.

CASE No. 8. D.G.H. Female, aet. 3 years.

26 Feb. 1908	1	Sore throat,
27 " "	2	Croupy cough.
29 " "	4	Rash; admitted. On admission fauces congested and covered with muco-purulent secretion; punctate erythema on trunk; slight stridor but no recession.
1 Mar. "	5	Fauces slightly ulcerated; stridor more marked; slight recession; colour good; cervical glands enlarged; nasal discharge.
2 " "	6	Voice husky.
3 " "	7	25 cc. anti-streptococcic serum injected.
5 " "	9	Stridor more marked, but recession very slight; 50 cc. anti-streptococcic serum injected.
6 " "	10	Considerable improvement.
9 " "	13	Stridor and recession marked; 25 cc. anti-streptococcic serum injected.
11 " "	15	Laryngitis completely disappeared.
12 Apr. "		Removed to convalescent hospital after a very protracted convalescence due to otorrhoea, ulceration of fauces, loss of teeth with caries of lower maxilla

CASE No. 9. P.W. male, aet. 5 years.

Date.	Day of disease.	
15 Oct. 1908	1	Sore throat.
16 " "	2	Croup.
17 " "	3	Admitted; on admission fauces very congested and covered with mucus: respirations hurried; croupy cough; stridor; recession; colour good; child very restless; vomiting; mottled rash on chest and limbs but on back punctate. Died suddenly at 11.30 p.m.

POST MORTEM.

Fauces: Injected but no ulceration.

Larynx and trachea: mucous membrane congested and swollen; no membrane.

Nothing worthy of note in abdominal and thoracic organs, except some haemorrhagic patches on the mucous membrane of the stomach.

CASE No. 10. H.T. female, aet. 4 years.

Date.	Day of disease.	
10 Feb. 1909	1	Sore throat.
11 " "	2	Rash; admitted. On admission fauces congested; rhinorrhoea; punctate erythema.
17 " "	8	Respirations rapid; bronchitis; left otorrhoea.

CASE No. 10. (Continued).

Date.	Day of disease.	
24 Feb. 1909	15	Voice hoarse: recession: troublesome cough. 8,000 units diphtheria antitoxin injected.
1 Mar. "	20	Hoarseness and recession still present; cough now croupy; colour poor and respirations rapid and shallow; lips slightly ulcerated.
2 " "	21	Recession and pallor very marked; pulse weak rapid and compressible. Tracheotomy performed and 25 cc. anti-streptococcic serum injected. After operation great relief but temperature high (103.4°) and respirations rapid and shallow; profuse rhinorrhoea; broncho-pneumonia.
8 " "	27	Patient very comfortable and sleeping well but obviously growing much weaker.
10 " "	29	Death at 8 p.m.

POST MORTEM.

Fauces: No ulceration.

Larynx: Deeply congested but no ulceration or membrane.

Trachea: Irregular jagged wound through first and second rings (tracheotomy wound) with some superficial ulceration of anterior wall due to pressure of tracheotomy tube; tissues around tracheotomy wound sloughing; a small localised abscess on left side of the trachea.

Lungs: Pleural adhesions on left posterior base; right lung extensively riddled with pyaemic infarcts most of which were on the point of breaking down.

CASE No. 11. L.Z. male, aet. 6 years.

Date.	Day of disease.	
27 Feb. 1909	1	Sore throat.
28 " "	2	Rash; admitted to E.H. On admission fauces congested; general punctate erythema.
20 Mar. "	22	Voice husky ; cough croupy.
23 " "	25	Laryngeal condition much the same; still husky and croupy.
26 " "	28	Absence of any laryngeal symptoms.
17 Apr. "		Discharged well.

CASE No. 12. W.F. male, aet. 6 years.

4 May, 1909	1	Sore throat; rash.
5 " "	2	Admitted to E.H. On admission fauces congested; punctate erythema on trunk and limbs.
6 " "	3	Child delirious; fauces covered with muco-purulent secretion; cervical glands enlarged.
8 " "	5	Hoarseness and aphonia; conjunctivae injected rhinorrhoea.
9 " "	6	Fauces and anterior nares ulcerated; child very restless; colour poor; respirations hurried but no recession; smaller joints swollen and inflamed; general condition much worse.
10 " "	7	Death.

POST MORTEM.

Fauces: Ulcerated.

Larynx: Mucous membrane reddened; considerable oedema of epiglottis arytenoids and cords.

CASE No. 13. G.O. male, aet. 5 years.

Date.	Day of disease.	
1 July, 1909	1	Sore throat; rash; admitted to E.H. On admission fauces congested; rhinorrhoea; punctate erythema on trunk.
6 " "	6	Two "convulsions" limited to right side and commencing in the muscles of the face; otorrhoea; purulent rhinorrhoea; fauces ulcerated.
13 " "	13	Cervical glands enlarged and tender; fauces swollen and ulcerated; regurgitation of food; bronchitis; very restless.
27 " "	27	Hoarseness croupy cough and recession; general condition much worse.
31 " "	31	Laryngeal symptoms still present but not so marked.
4 Aug. "	35	Attack of haematemesis; patient blanched and very restless.
		Considerable amount of blood lost but haemorrhage ceased under appropriate treatment.
5 " "	36	Died. No post mortem.

CASE No. 14. M.C. female, aet. $2\frac{6}{12}$ years.

23 July, 1909	1	Sore throat; rash; admitted to E.H. On admission fauces congested; submandibular glands enlarged; rhinorrhoea; general punctate erythema.
27 " "	5	Fauces superficially ulcerated; voice hoarse.
29 " "	7	Hoarseness and inspiratory stridor.
1 Aug. "	10	Hoarseness and stridor still present; no recession.
5 " "	14	Laryngeal symptoms much the same.
12 " "	21	No evidence of laryngitis.
21 Sept. "	30	Discharged well.

CASE No. 15. M.R. female, aet. 2 years.

Date.	Day of Disease.	
1.Nov. 1909	1	Sore throat.
2 " "	2	Rash; admitted. On admission fauces congested; rhinorrhoea; conjunctivitis; enlarged cervical glands; general punctate erythema.
4 " "	4	Child restless and not sleeping well; profuse rhinorrhoea.
5 " "	5	10 c.c. anti-streptococcic serum.
6 " "	6	10 " " " "
7 " "	7	10 " " " " No visible improvement.
8 " "	8	40 c.c. anti-streptococcic serum.
9 " "	9	25 " " " " Child quieter and brighter and slept better.
11 " "	11	Croupy cough; slight dyspnoea; very restless; tonsils ulcerated; profuse rhinorrhoea; enlarged cervical glands.
14 " "	14	Paroxysmal attacks of dyspnoea. Tracheotomy; slept well and appeared comfortable.
17 " "	17	Temperature settling; perforation left anterior pillar of fauces.
19 " "	19	Tracheotomy tube removed.
21 " "	21	Sudden cyanosis and difficulty in breathing and tube replaced.
22 " "	22	Right anterior pillar perforated; broncho-pneumonia.
25 " "	25	Death.

POST MORTEM.

Fauces: Tonsils ulcerated; perforation of both anterior pillars.

Larynx deeply congested but no membrane or ulceration observed.

Trachea tracheotomy wound through 1st & 2nd rings.

Lungs: broncho-pneumonia.

CASE No. 16. E.P. female, aet. 6 years.

Date.	Day of disease.	
6 Oct. 1911	1	Sore throat.
10 " "	5	Rash; admitted; on admission fauces congested; cervical glands enlarged; general punctate erythema.
12 " "	7	Fauces covered with mucous secretion; cervical glands more enlarged; rhinorrhoea; vomiting; delirium.
13 " "	8	Stridor and recession; cyanosed; restless; gradually became moribund and died 9 a.m.
		No post mortem.

CASE No. 17. J.D. male, aet. 8 years.

25 Oct. 1911	1	Sore throat; croupy cough; general rash;
26 " "	2	Admitted; on admission fauces congested; general punctate erythema; croupy cough and recession of lower chest walls and supra-sternal notch. 12,000 units diphtheria antitoxin administered.
27 " "	3	Coughed up some blood-stained mucus and exudate.
29 " "	5	Epistaxis; several membranous casts coughed up during the night; organisms in casts on bacteriological examination consisted of minute bacilli; no K.L.B.
30 " "	6	Fauces clean; general improvement in child's condition.
30 Nov. "		Child discharged well.

CASE No. 18. A.G. male, aet. 3 years.

Date.	Day of disease.	
2 Nov. 1911	1	Rash.
3 " "	2	Sore throat; admitted. On admission fauces congested; punctate erythema on trunk.
6 " "	5	Fauces ulcerated; profuse rhinorrhoea; enlarged cervical glands; delirious.
12 " "	11	Blotchy septic rash on cheeks, arms and legs.
15/17 " "	14/16	Faucial ulceration increasing; each day received 500 million staphylococcus vaccine.
18 " "	17	Voice husky and weak; otorrhoea.
21 " "	20	Hoarseness and aphonia much the same.
23 " "	22	Laryngeal symptoms disappearing.
30 May, 1912		Patient discharged after passing through a very severe attack of scarlet fever developing suppurative adenitis and ulceration of the lower lips with stenosis of the orifice of the mouth.

CASE No. 19. R.C. male, aet. 1½ years.

Date.	Day of disease.	
9 Dec. 1911	1	Sore throat; rash.
11 " "	3	Admitted. On admission fauces congested; general punctate erythema.
12 " "	4	Tonsils ulcerated; cervical glands enlarged; rhinorrhoea; hoarseness; croupy cough; dysphagia; general condition very bad; died 8 p.m.

No post mortem.

CASE No. 20. B.Z. Female, aet. 1½ years.

Date.	Day of disease.	
25 June, 1904	1	Sore throat; rhinorrhoea; cough.
27 " "	3	Rash.
28 " "	4	Admitted; on admission slight ulceration left tonsil; general punctate rash.
30 " "	6	Croupy cough; slight stridor.
2 July, "	8	Croupy cough; stridor and recession marked; low tracheotomy performed, under chloroform, at 10.30 p.m. considerable relief.
4 " "	10	Cervical glands enlarged; breathing comfortable; good deal of mucous discharge from the tube; tracheotomy wound red and swollen; some surgical emphysema over the front of the chest; temperature 101.6°; pulse rapid.
6 " "	12	During night breathing very rapid and alae nasi working vigorously; temperature still high; signs of broncho-pneumonia.
8 " "	14	No improvement and child died 8.30 p.m.

POST MORTEM.

Fauces: Tonsils ulcerated.

Larynx: Good deal of ulceration on each side just above the cords and also on posterior parts of each cord.

Lungs: Patches of consolidation in each lung.

CASE No. 21. E.K. Male, aet. 10 months.

Date.	Day of disease.	
19 June, 1905	1	Rash; rhinorrhoea.
22 " "	4	Vomiting.
23 " "	5	Admitted; on admission faint punctate rash on body and bright red rash on ankles and feet; fauces injected and covered with purulent exudation; rhinorrhoea.
25 " "	7	Passed rather a restless night; marked recession and stridor in the morning; colour poor; some redness of left eye and cervical glands greatly enlarged; oedema of the glottis; child gradually became worse and was intubated with considerable but not complete relief in breathing.
26 " "	8	Later became moribund with Cheyne-Stokes respiration and died at 10 a.m.

POST MORTEM.

Fauces: Small ulcer on each tonsil.

Larynx: Two small ulcers at the base of the epiglottis; aryterio-epiglottidean folds oedematous; mucous membrane hyperaemic:

Lungs: Extensive broncho-pneumonia of left lung.

CASE No. 22. R.C. male, aet. 8 years.

Date.	Day of disease.	
16 Aug. 1905	1	Sore throat; rash; admitted. On admission fauces injected; cervical glands enlarged; rhinorrhoea; general punctate erythema.
18 " "	3	Fauces ulcerated; cervical glands softening.
26 " "	11	Right side of neck sloughing; nose very septic; fauces covered with dirty mucus.
28 " "	13	Sloughing extending in area and depth; general condition very poor and child restless and unable to sleep.
31 " "	16	Some difficulty in swallowing; troublesome cough with regurgitation of food, nasal feeding employed. At 11.30 p.m. stridor and recession and increased restlessness.
1 Sept. "	17	Stridor and recession very marked; colour fairly good and child sleeping; voice clear.
4 " "	20	Hoarseness; cough hacking and constant; colour slightly blue and patient unable to lie down; stridor not so marked. Owing to increasing restlessness small dose Tr. Opii administered with good result.
6 " "	22	Child weaker; restless; delirious; pulse rapid, small and compressible and breathing laboured; faucial ulceration increasing and sloughing of neck slowly spreading. Some of the branches of facial nerve involved in the ulcerative process as slight paralysis of right labial muscles.
8 " "	24	Voice very weak and general condition much worse.
9 " "	25	During night haemorrhage from neck and mouth.
10 " "	26	Died at 2.30 a.m.

CASE No. 22. (Continued).

POST MORTEM.

Large ulcerated excavated patch on the right side of the neck extending from the lower jaw to half way down the neck (size of palm of hand) exposing the sterno-mastoid, submaxillary gland, and some cervical glands adjacent to the parotid. A large slough was present in the centre of patch which on being removed was found to be continuous with a large mass surrounding the carotid sheath. At the upper part it was separated from the floor of the mouth by a thin layer of muscle; the sterno-hyoid ligament and the posterior belly of the digastric were exposed. At the angle of the slough there was a direct communication with the pharynx. The opening was about the diameter of an ordinary pencil.

Pharynx: Both tonsils sloughed away; at the lower edge of the right tonsil was the opening described above.

Larynx: Small ulcers baring cartilage lay on the anterior and internal surfaces of both arytenoids; cords normal.

Trachea: Linear ulcerations on both sides about 1" long over first and second rings; no connection between these and the external ulceration in the neck.

Lungs: Left normal; right riddled with small abscesses and pus could be squeezed from the bronchioles.

CASE 23. A.C., male, aet. 3 years.

Date.	Day of disease.	
18 Sep. 1905	1	Sore throat; rhinorrhoea.
19 " "	2	Admitted. On admission well marked punctate erythema; fauces congested; rhinorrhoea; cervical glands enlarged; bronchitis; child very ill.
26 " "	9	Regurgitation of food; nasal feeding adopted.
27 " "	10	Patient much worse; died 4 a.m.

POST MORTEM:

Fauces: Both tonsils ulcerated.

Larynx: Arteno-epiglottidean folds swollen and surfaces slightly roughened; both vocal cords slightly ulcerated; both larynx and trachea contained much purulent material and were markedly hyperaemic.

Lungs: Septic broncho-pneumonia and pleurisy in both.

CASE 24. W.W., male, aet 2 years.

Date.	Day of disease.	
18 Dec.1905	1	Sore throat; vomiting.
5 Jan.1906	19	Admitted. On admission rhinorrhoea; otorrhoea; cervical adenitis; patchy erythema on arms and buttocks; bronchitis.
9 " "	23	Hoarseness, stridor and recession; fauces very swollen; cervical glands very enlarged.
12 " "	26	Stridor and recession extreme; tracheotomy under chloroform performed; relief considerable and child rested and took nourishment well; 10 c.c. antistreptococcic serum.
13 " "	27	10 c.c. antistreptococcic serum.
17 " "	31	Tube removed for four hours and appeared to do well without it.
18 " "	32	Removed for gradually increasing periods each day.
3 Feb. "	48	Removed and not replaced.
5 " "	50	Attack of cyanosis stridor and recession; tracheotomy wound re-opened and tube replaced.
6 " "	51	Tube removed and returned an hour later. This was done over a period of several days the intervals between the removal and re-insertion of the tube being gradually increased.
21 " "	72	Removed and not replaced.
27 " "	78	Sudden attack of cyanosis stridor and recession and tube replaced.
2 Mar. "	81	Tube removed for a short time each day; this time successful.
10 Apr. "		Child progressed rapidly and with exception of otorrhoea was sufficiently well to be discharged on this date.

CASE 25. G.J. male, aet. 3½ years.

Date.	Day of disease	
4 Sep. 1906	1	Sore throat; vomiting.
5 " "	2	Rash; admitted. On admission fauces swollen and red; punctuate rash back, chest and buttocks; cervical glands enlarged.
6 " "	3	Profuse rhinorrhoea.
8 " "	5	Lips ulcerated.
12 " "	9	Cellulitis neck and lower eyelids; taking nourishment and sleeping well.
13 " "	10	Right knee, ankles and some of smaller joints swollen and red; lips, uvula and soft palate ulcerated; breath very foetid.
14 " "	11	Voice husky; no restlessness; no recession.
15 " "	12	Hoarseness more marked: restlessness and recession.
17 " "	14	Stridor; recession increased; colour good but child restless; vomiting and diarrhoea.
18 " "	15	Stridor and recession not so marked but child weaker; died 5 p.m.
		No post mortem.

CASE 26. P.W. male, aet 1½ years.

Date.	Day of disease.	
18 Feb.1907	1	Sore throat; rash.
19 " "	2	Admitted. On admission fauces inflamed and swollen; punctate rash on limbs; cervical glands swollen.
25 " "	8	Profuse purulent rhinorrhoea; glands more swollen; membranous exudate on tonsils and uvula; croupy cough; no stridor or recession.
1st Mar. "	12	"Convulsions" involving the left side; child in semi-conscious condition; colour poor; cervical glands very enlarged and inflamed; neck and lips inflamed; fauces ulcerated; temperature 103°; pulse rapid but regular; respirations hurried with some recession and cyanosis; croupy cough still present; tracheotomy performed but without much relief and child died at 7.30 p.m. apparently from toxaemia.
		No post mortem.

CASE 27. C.A. female, aet 5 years.

Date.	Day of diasase.	
1 Apr.1907	1	Rash; vomiting.
2 " "	2	Admitted. On admission coarse punctate erythema on back and thighs; on face and chest fine macular rash; cervical glands swollen and tender.
4 " "	4	Rash fading and shewing only as isolated macules on the face and trunk.
7 " "	7	Rash faded; nostrils excoriated from purulent nasal discharge; tonsils ulcerated.
15 " "	15	Perforation right side of palate; general condition very poor; harsh cough; respirations hurried and shallow; pulse rapid, weak and compressible; temperature high, 103.2°; colour poor - pale with bluish tinge around lips and nostrils; vomiting.
17 " "	17	Fauces slightly improved but ulceration around perforation appears to be spreading; broncho-pneumonia, dyspnoea and slight recession.
19 " "	19	Dyspnoea and recession more marked; child sinking.
20 " "	20	Died 3 a.m.

No post mortem.

CASE 28. J.G. male, aet. 5 years.

Date.	Day of disease.	
27 May 1907	1	Sore throat.
30 " "	4	Rash.
1 June "	6	Admitted. On admission fauces congested and exudate on tonsils; general punctate erythema; general condition poor.
2 " "	7	Profuse rhinorrhoea; fauces very inflamed and tonsils covered with muco-purulent deposits; cervical glands very enlarged; very restless.
3 " "	8	Some membrane came away; (no K.L.B.; Streptococci and staphylococci); pulse full and regular; colour bad; temperature 103°.
6 " "	11	Fauces slightly improved; slight regurgitation of food; cough after feeding; nasal feeding adopted.
9 " "	14	Large perforation of fauces on left side; otorrhoea; lungs clear.
12 " "	17	Condition much the same.
17 " "	22	Râles in both lungs; cough troublesome; colour poor; respirations normal.
26 " "	31	Voice feeble and husky; colour very poor at times; ulceration of larynx suspected.
29 " "	34	Hoarseness slightly more marked.
4 July "	40	Condition much the same.
8 " "	44	Broncho-pneumonia; child much weaker.
18 " "	54	Post-pharyngeal abscess incised and pus evacuated.
23 " "	59	Child growing weaker.
26 " "	62	Died.

CASE No.28 (continued)

POST MORTEM.

Fauces: Tonsils sloughed away; double perforation; each perforation 1" in length; the edges were composed of healthy granulations.

Larynx: Epiglottis enlarged and chronically inflamed, several small granulations on both vocal cords.

Lungs: Right lung consolidated; right sided empyema.

CASE 29. H.D. male, aet. 2½ years.

Date.	Day of disease.	
28 June 1907	1	Sore throat; rash.
30 " "	3	Admitted. On admission fauces ulcerated; enlarged cervical glands; general punctate erythema.
1 July "	4	Delirious; temperature 101°.
3 " "	6	Patient distinctly better; white deposit on tonsils.
5 " "	8	Deposit on tonsils spread to palate; ulceration increasing; broncho-pneumonia.
8 " "	11	Child growing weaker; otherwise much the same.
10 " "	13	Ulceration of fauces continues to spread.
12 " "	15	Died at 7 a.m.

POST MORTEM:

Fauces: Marked ulceration of uvula, soft palate and both tonsils; on the right side had spread to the hard palate; part of left anterior pillar and part of left pharynx had disappeared.

Larynx: Extensive ulceration on either side of the epiglottis between the latter structure and the posterior surface of each ala of the thyroid cartilage; more marked on the right side; upper half of the epiglottis ulcerated; slight superficial ulceration of true and false vocal cords on the right.

Lungs: Several enlarged glands containing pus adherent to two main bronchi; septic broncho-pneumonia on right; bronchiectasis probably due to compression of the bronchi by the mass of enlarged glands mentioned above.

CASE 30. G.G. male aet 5 years.

Date	Day of disease	
18th July 1907	1	Sore throat: vomiting.
19 " "	2	Rash: enlarged cervical glands: admitted. On admission fauces injected: punctate erythema on trunk and limbs.
21 " "	4	Macular rash on arms and thighs: no Koplik's spots: fauces much inflamed: cervical glands swollen and tender.
24 " "	7	Child very ill: temperature 102° pulse 180: trunk covered with a dark mottled rash: fauces ulcerated and nostrils excoriated from a profuse rhinorrhoea.
25 " "	8	Child slightly better.
27 " "	10	Ulceration spread to soft palate: suppression of urine; heart sounds very weak: scattered rales on lungs: died 9.30 p.m.

POST MORTEM.

Fauces: Tonsils and soft palate ulcerated: adenoid material at back of pharynx suppurating.

Larynx: Epiglottis swollen and covered with a dirty greenish slough which extended down the larynx which was also of a dirty greenish colour.

Trachea: Contained purulent matter:

Lungs: Signs of commencing septic broncho pneumonia: bronchioles contained pus.

CASE 31. J.W. male aet 8 years.

Date	Day of disease	
18 Sep. 1907	1	Sore throat: cough.
21 " "	4	Rash.
27 " "	10	Admitted. On admission semi-conscious: cough distinctly croupy: fauces congested: cervical glands enlarged: general desquamation: broncho-pneumonia and pleurisy: eyes and ears discharging: respirations rapid and shallow: pulse 140 weak and compressible: temperature 102.8°.
30 " "	13	Patient growing weaker.
2 Oct. "	15	Ulceration of right cornea: cough still croupy.
3 " "	16	Very restless: cough croupy but no stridor or dyspnoea: eye much worse: general condition very bad.
4 " "	17	Died at 2 a.m.

POST MORTEM.

Fauces: Considerable ulceration at back of throat.

Larynx: The ulceration extended from the throat as far as the base of the cricoid cartilage: epiglottis front and back, and the arytenoepiglottidean folds deeply ulcerated: mucous membrane deeply injected: injection extended down to bifurcation of trachea.

Lungs: Septic broncho-pneumonia.

CASE 32. A.F. male aet 4 years.

Date	Day of disease	
28 Oct. 1907	1	Vomiting: sore throat: general rash: admitted. On admission fauces congested: cervical glands enlarged: general punctate erythema.
30 " "	3	Tonsils ulcerated: profuse rhinorrhoea.
4 Nov. "	8	Ulceration of fauces spreading: hoarseness and slight recession.
7 " "	11	Growing worse: hoarseness and recession still present: pulse irregular: taking nourishment badly.
11 " "	15	Lobar-pneumonia left base: cough croupy: child in great distress and almost moribund: tracheotomy performed and mucus and membrane removed through wound: considerable relief.
12 " "	16	Appears much more comfortable.
14 " "	18	Growing weaker.
16 " "	20	Respirations very rapid: pulse very weak: died 2.30 p.m.

POST MORTEM

Fauces: Much ulcerated but healing.

Larynx: Thickened and ulcerated but retains its outline: small ulcer on each vocal cord: no membrane.

Trachea: Upper part congested and ulcerated: no membrane: tracheotomy wound sloughing.

Lungs: Lobar pneumonia and bronchiectasis in both lungs.

CASE 33. F.R. male aet 2½ years.

Date:	Day of disease	
12 Nov. 1907	1	Sore throat: Rash: rhinorrhoea: admitted. On admission fauces inflamed: punctate erythema on trunk and thighs.
13 " "	2	Tonsils ulcerated: child very restless: heart very feeble: cervical glands enlarged.
16 " "	5	Laryngeal stridor: pulse weak: culture from fauces showed pure growth of stphylococci. Died same afternoon.

POST MORTEM.

Fauces: Extensively ulcerated.

Larynx: Superficial ulceration on both vocal cords and in the neighbourhood of the upper aperture of the larynx: slight purulent exudate present in both larynx and trachea.

Lungs: Broncho-pneumonia.

CASE 34. W.J. male aet 5 years.

25 Dec. 1907	1	Sore throat.
26 " "	2	Vomiting
27 " "	3	Rash: admitted. On admission tonsils ulcerated and fauces generally congested: punctate erythema.
31 " "	7	Cervical glands enlarged.
1 Jan. 1908	8	Soft palate ulcerated: child very restless: respirations rapid.

CASE 34 (Continued)

Date:	Day of disease	
3 Jan. 1908	10	Ulceration of palate spreading: child died suddenly in afternoon.

POST MORTEM.

Fauces: Soft palate extensively ulcerated.

Larynx: Extensive ulceration and necrosis on epiglottis vocal cords and upper half of the larynx.

Lungs: Septic broncho-pneumonia.

CASE 35. A.W. male aet 1 year 9 months.

29 Dec. 1907	1	Rash.
6 Jan. 1908	9	Admitted. On admission ulceration of tonsils and uvula: staining of trunk: rhinorrhoea profuse and nostrils excoriated: cervical glands enlarged: Temperature 103.2°.
7 " "	10	Macular erythema wrists, knees, and ankles: regurgitation of food: pulse rapid and compressible: respirations hurried and shallow: recession of chest walls: coarse râles over both bases. Child died at 8.40 p.m.: temp. 105° just before death.

POST MORTEM.

Fauces: Superficial sloughing of tonsils, uvula, soft palate, and lateral pharyngeal walls down to pyriform fossae.

CASE 35 (Continued)

Larynx: Tip of epiglottis ulcerated: also part of the arytenoids.

Lungs: Generally congested.

CASE 36. L.W. female aet 3 years.

Date:	Day of disease	
25 Ap. 1908	1	Vomiting.
28 " "	4	Rash
29 " "	5	Sore throat
30 " "	6	Admitted. On admission blotchy rash on trunk but distinctly punctate in parts: cervical glands enlarged: eyes and nose discharging profusely: fauces ulcerated.
1 May "	7	General condition very poor.
4 " "	10	Slight regurgitation of food: taking nourishment well.
8 " "	14	Child much the same.
12 " "	18	Hoarseness and irritating croupy cough: colour good.
14 " "	20	Breathing very distressed at times and child very restless.
18 " "	24	Occasional attacks of dyspnoea: voice still hoarse and croupy: colour good.
19 " "	25	Death occurred suddenly at 2.30 a.m.

No post mortem.

CASE 37. C.M. male aet 10 months.

Date	Day of disease	
17 June 1908	1	Rash: vomiting: admitted. On admission fauces inflamed: fine punctate erythema on trunk.
21 " "	5	Profuse rhinorrhoea: cervical glands enlarged: fauces covered with glairy mucus.
23 " "	7	Extensive ulceration of tonsils and uvula: respirations hurried and shallow: colour poor: swallowing difficult: nasal feeding adopted.
26 " "	10	Breathing difficult: deep recession of chest walls: face pale and livid: lips ulcerated: pulse very weak: temperature 100-102.4 at 3 p.m. dyspnoea and recession increased and low tracheotomy performed: followed by marked relief both in breathing and general condition.
28 " "	12	Child's condition very satisfactory
30 " "	15	Unable to do without tube: mucus discharging through wound.
8 July "	23	In afternoon became suddenly cyanosed but recovered after getting rid of a quantity of mucus.
16 " "	31	Double otorrhoea.
16 Sep. "		Discharged well.

CASE 38. W.M. male aet 21 years.

7 Feb. 1910	1	Sore throat: rash.
20 " "	14	Admitted. On admission cervical adenitis: general desquamation: albuminuria: face puffy: teeth very decayed and mouth in a very septic state.

CASE 38 (Continued)

Date	Day of disease	
23 Feb. 1910	17	Blood in urine: (present till the end).
24 " "	18	Frequent irritating cough: smear from mouth examined for fusiform bacilli and spirilla but only cocci found.
21 Mar. "	43	Stridor and hoarseness: dysphagia: stridor and hoarseness increased during the night but patient appeared comfortable: no cyanosis.
22 " "	44	Died suddenly in morning.

POST MORTEM

Mouth: Gums considerably ulcerated and in places lower jaw laid bare.

Fauces: No signs of ulceration; extreme oedema of mucous membrane lying between the tongue and epiglottis.

Larynx: Epiglottis ulcerated on its upper surface; within the larynx in the region of the arytenoid cartilage on each side was an ulcer $\frac{1}{2}$" in diameter: ulcers deep and undermined and formed by slough and necrosed cartilage: mucous membrane of larynx and upper part of trachea oedematous. A smear from the ulcers in the larynx showed large numbers of fusiform bacilli and in smaller number spirilla. cocci and other bacilli were also present. (According to Dr. Goodall the ulceration was due directly to the septic condition of the mouth).

CASE 39. R.H. female aet 3 years.

Date	Day of disease	
6 Mar. 1910	1	Vomiting.
7 " "	2	Rash: admitted. On admission fauces congested: general punctate erythema: bronchitis: respirations rapid.
11 " "	6	Broncho-pneumonia: fauces inflamed and slightly ulcerated: profuse rhinorrhoea: cervical glands enlarged: restless and vomited once or twice: temperature 103.2°: pulse weak: breathing rapid: nasal feeding adopted owing to difficulty in swallowing.
15 " "	10	Patient not so well: slight cyanosis.
16 " "	11	Some recession of chest walls and stridor: double pneumonia present: nostrils and lips ulcerated: in afternoon stridor and recession very marked: low tracheotomy performed with marked relief.
17 " "	12	Appears slightly better.
18 " "	13	Cyanosis returned: respirations shallow and weak.
19 " "	14	Died.

POST MORTEM:

Fauces: Tonsils and right anterior pillar ulcerated: right tonsil covered with yellowish slough.

Larynx: On folds passing down from base of epiglottis to superior cornu of thyroid cartilage were two ulcers, one on each side, about midway between the epiglottis and the cornu: ulcerated surface about size of

threepenny piece and had yellowish deposit upon it: ulceration shallow: very small ulcer in middle of right true vocal cord and another in front just between the anterior extremities of the two true vocal cords. Cervical, submaxillary, trachael and bronchial glands enlarged and soft tubes dilated.

Lungs: Pleurisy and broncho-pneumonia.

CASE 40. A.A. male aet 1 yr. & 9 months.

Date	Day of disease	
6 July 1910	1	Sore throat
7 " "	2	Rash: vomiting: rhinorrhoea: cervical glands enlarged.
8 " "	3	Admitted. On admission fauces congested: general punctate erythema.
9 " "	4	Child very restless: temperature 102°: fauces ulcerated: fine discrete macular rash on lower abdomen and in the groins: respirations rapid: colour bluish: taking nourishment badly.
10 " "	5	Child very restless: dyspnoea cyanosis stridor and marked recession present: low tracheotomy under chloroform performed with considerable relief: fauces examined at same time and tonsils seen to be severely ulcerated
20 " "	15	Tube removed for increasing periods each day.
25 " "	20	Sudden thoracic recession with stridorous breathing: tube re-introduced with immediate relief: few rales in chest.

CASE 40 (Continued)

Date	Day of disease	
4 Aug. 1910	30	Tube removed and not replaced.
19 " "	45	In early morning after breakfast suddenly collapsed and became cyanosed: artificial respiration performed and tube reintroduced vomited slightly and breathing at once became easier suggestive of some food material in the larynx.
21 " "	47	Tube permanently removed.
31 " "	57	Slight left otorrhoea.
26 Sep. "		Discharged.

CASE 41. A.S. male aet 5 years & 11 months

6 Oct. 1912	1	Sore throat: no history of rash.
10 " "	5	Admitted. On admission fauces inflamed: punctate erythema on trunk.
26 " "	21	General punctate erythema. Fauces covered with sticky mucus.
30 " "	25	Profuse rhinorrhoea: joint pains: cervical glands enlarged: fauces dry and glazed.
4 Nov. "	30	Child much the same.
11 " "	37	Child suddenly collapsed with pallor and cyanosis: dullness over right lower lobe.
12." "	38	Child very ill: respirations very rapid: pallor and cyanosis marked: died 11 p.m.

POST MORTEM.

Fauces: Tonsils ulcerated.

Larynx: Epiglottis much thickened, injected and ulcerated: true and false vocal cords considerably ulcerated with small reddish granulations on surface: ulceration just above the cords.

Trachea: Inflamed and swollen.

Lungs: Broncho-pneumonia right lower lobe.

A P P E N D I X B.

A CASE OF LARYNGEAL STENOSIS FOLLOWING SCARLET FEVER; ADMITTED TO GUY'S HOSPITAL FROM EASTERN FEVER HOSPITAL.

by

P. T.

"Guy's Hospital Gazette"

July 3rd, 1897, p.323

"Eleanor F., aet. 7, admitted February 26th, 1897, for inability to breathe without the use of a tracheotomy tube, and for dry gangrene of three fingers following an attack of scarlet fever.

Previous History: Patient was admitted to the Eastern Fever Hospital on July 30th, 1896. The following particulars of her illness were kindly supplied by Dr. Goodall. Patient had a bad attack of scarlatina anginosa, with ulceration of the fauces, nasal discharge, double otorrhoea and bronchitis. A cultivation was taken from the throat, but only streptococci and staphylococci were found; no Klebs-Loffler bacilli. Her sister was also admitted a few days later with scarlet fever, of which she died.

On August 14th symptoms of laryngeal obstruction appeared, which was considered to be due to ulceration of the mucous membrane of the larynx.

The obstruction increased and on August 17th tracheotomy was performed.

On August 22nd there were signs of bronchopneumonia which lasted about ten days.

The gangrene of the fingers commenced on September 1st, the tip of the nose, the ears, and the ends of the left index and both middle fingers becoming purple and painful. On September 8th, the ends of

the fingers became gangrenous, a line of demarcation being formed by October 6th, while the patches on the ears and nose cleared up without any gangrene. A purple patch also appeared over the right cheek, and two soft swellings which developed rapidly below and behind the left ear, the latter being incised and pus evacuated.

On October 12th an india-rubber tracheotomy tube was substituted for the silver tube, and for the next six weeks attempts were made to get the child to do without the tube, but without success.

November 21st. An intubation tube was inserted under an anaesthetic, adhesions being felt to go in the larynx, and for a week the child continued to use both tubes.

The tracheotomy tube was then omitted and O'Dwyer's tubes of gradually increasing sizes used and by December 7th the tracheotomy wound had healed.

On that date patient bit through the string, securing the tube, and on attempting to remove it, it slipped off the director and became wedged behind the posterior nares and above the larynx.

She became very cyanosed and tracheotomy was again performed the tracheotomy tube being left in till the next day, when O'Dwyer's tube was replaced.

This was worn till December 31st, the patient being very comfortable, but quite unable to do without the tube for a minute, the tracheotomy wound having in the meantime again healed.

On that day, however, great difficulty was again experienced in replacing the intubation tube after removal for cleansing purposes, and patient got so bad that tracheotomy was again performed.

Since that date she has continuously worn a rubber tracheotomy tube, no intubation tube having been used at all. Patient was then sent up to Guys.

On Admission: Patient is a thin, weak-looking child. There is a double otorrhoea; urine is normal. The last phalanx of the left index finger is in a state of dry gangrene, and the last phalanx of the left middle finger has completely separated.

The last phalanx of the right index has gone, but a necrosed piece of bone remains.

A laryngoscopic examination was made, but nothing definite could be made out, owing to deformity of the larynx.

The ears were syringed with boracic lotion twice a day, and the rubber tracheotomy tube removed for a few minutes twice every day, but whenever it was removed patient seemed very uncomfortable, and always cried.

The time the tube was left out was gradually increased till at last it was left out for two hours, but on one of these occasions patient became very cyanosed, and some difficulty was experienced in replacing the tube.

A fenestrated tube was then tried, the patient being made to take deep inspirations with the external aperture of the tube closed.

None of these methods had any effect in causing air to pass through the larynx.

On April 17th, Mr Symonds examined the patient and found that the epiglottis was deformed and larynx atrophied, the deformity preventing the interior of the larynx from being seen.

Mr Symonds suggested that a silver Durham's tube should be substituted for the indiarubber, which he thought would cause some of the granulation tissue to be absorbed.

On April 18th A.C.E. was administered and Mr Symonds endeavoured to pass O'Dwyers tubes, but was unable to do so; a laryngeal dilator was passed after some difficulty, but an O'Dwyers tube could not be introduced even after this. Mr Symonds thought the obstruction was due to cicatricial contraction.

Operation: On May 10th A.C.E. was administered and the wound opened up by an incision one and a half

inches long above the fistula, and half an inch in a downward direction. A flap of granulation tissue was found attached to the lower margin of the fistula, which moved with respiration.

This was removed and an attempt made to pass a probe up into the larynx.

This, however, was found to be impossible.

The cricoid cartilage was then divided, and white scar tissue was found completely obstructing the larynx. This was removed and an O'Dwyers tube passed through the glottis from the mouth.

The wound was closed with the exception of the original fistula.

After the operation the child breathed through her nose and mouth, but the tube was coughed up, and the tracheotomy tube was replaced.

For the next few days patient breathed both through the tube and through wound.

The breathing through the mouth, however, became very noisy, and Mr Symonds tried to pass a larger tube. This could not be done and so the smaller tube, and also the tracheotomy tube were replaced. It soon became evident that it would be impossible to restore the natural channel for breathing, as the lumen of the cricoid had been obliterated.

Mr Symonds decided to insert a permanent silver tube for respiration, with an inner tube passing

upwards, through an opening in the outer tube, into the cricoid ring.

When this was fitted the child could make a hoarse laryngeal sound.

Later on Mr Symonds thought dilatation might be affected from below.

Dr. Goodall in his letter states that he feels pretty certain that the laryngeal obstruction was due to ulceration spreading from the fauces, the inability to do without the tube being due to the larynx being extensively damaged.

Such a condition following scarlet fever is very rare, possibly owing to the fact, that cases with such extensive ulceration would usually be fatal. It was obviously not one of those cases where the tube could not be removed owing to fright on the part of the child, as in such a case the use of a fenestrated rubber tube would cause air to pass through the larynx. The commencement of the gangrene of the fingers appeared rather as a haemorrhage in the skin, than as true 'Raynaud's disease'."